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ABSTRACT

This manual contains a work sample intended to assess a handicapped student's interest in and potential to enter a training program in electronics assembly or in a similar program. Section 1 describes the assessment, correlates the work performed and worker traits required for completing the work sample, and lists related occupations and DOT codes. Instructions to the evaluator are provided in the next section. The conditions and administration equipment are detailed, and the set-up and breakdown procedures are illustrated. The section on administration provides a student orientation including student material with an explanation and illustration of equipment and/or procedures. Instructions for task procedures actions to be taken, as well as post sample interview topics are also covered. Section 4 explains the method of scoring and provides forms. Section 5 lists technical data (norms, reliability, validity) to be included in a supplement to this manual. Contents of the section on maintenance and construction include information on tool and equipment maintenance and a materials list (equipment, source, price). Section 7 cites references. An appendix defines terms. (YLB)

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ELECTRONICS ASSEMBLY

Work Sample

ED376629

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I. INTRODUCTION

A. Assessment Description

The Electronics Assembler Work Sample is intended to assess a student's interest in and potential to enter a training program in Electronics Assembly (DOT 726.684-018) or in a similiar program. The Electronics Assembler falls within the occupations in Assembly and Repair of Electronic Components and Accessories N.E.C. Occupational Group Arrangement and the Production Work Worker Trait Group.

The work performed and worker trait groups required for the completion of the Electronics Assembler Work Sample are as follows:

WORK PERFORMED	WORKER TRAITS REQUIRED	
1. Assembles electronic components.	GED	R-2, M-1, L-1, T-2
	SVP	1
	APT	G-4, V-4, N-4, S-4, P-4, Q-4, K-3, F-3, M-3, E-5, C-4
	WA	1, 3
	WS	2, 10
	PD	L, 4, 5, 6
2. Positions and alines parts in specific relationship to each other.	GED	R-2, M-2, L-1, T-2
	SVP	1
	APT	G-4, V-4, N-4, S-4, P-4, Q-4, K-3, F-3, M-3, E-5, C-4
	WA	1, 3
	WS	2, 10
	PD	S, 4, 5, 6
3. Mounts components.	GED	R-2, L-1, M-1, T-2
	SVP	1
	APT	G-4, V-4, N-4, S-4, P-4, Q-4, K-3, F-3, M-3, E-5, C-4
	WA	1, 3
	WS	2, 10
	PD	S, 4, 6
4. Connects wire lead by soldering.	GED	R-2, M-1, L-1, T-2
	SVP	1
	APT	G-4, V-4, N-4, S-4, P-4, Q-4, K-4, K-3, F-3, M-2, E-5, C-5
	WA	1, 3
	WS	2, 10
	PD	L, 4, 6

B. *Related Occupations*

Electronic Assembler Work Sample,
DOT description:
ELECTRONIC ASSEMBLER (726.684-018)

Related Occupations	*DOT Code*
ELECTRONICS INSPECTOR I	726.381-010
PRODUCTION REPAIRER	726.381-014
ELECTRONIC-SCALE SUBASSEMBLER	726.684-014
ELECTRONICS INSPECTOR II	726.684-022
ELECTRONICS WORKER	726.687-010
CABLE MAKER	728.684-010
ELECTRICAL LINE SPLICER	728.684-014
WIREWORKER	728.687-010
CAPACITOR ASSEMBLER	729.684-014

II. INSTRUCTIONS TO THE EVALUATOR

A. Work Sample Conditions

The Electronic Assembler Work Sample is to be administered indoors with moderate noise from adjoining areas, and good overhead and bench lighting. The sample involves sedentary work; reaching, handling, fingering and seeing, and can be done by a two armed person from a chair or wheelchair. This sample was designed to closely similate electronic assembly as it used in an electronic assembler training program as may exist in a comprehensive high school or technical school. The sample contains the hazzard of using a heated soldering iron and requires the necessary precautions to prevent fires or personal burns, including the proper use of a suitable stand or fixture to hold the iron when not in use. In addition, all health and safety precautions prescribed by OSHA must be adhered to.

B. Administration Equipment

The following equipment is required prior to administration:

Evaluator Equipment:

- manual for the Electronic Assembler Work Sample
- task observation sheet

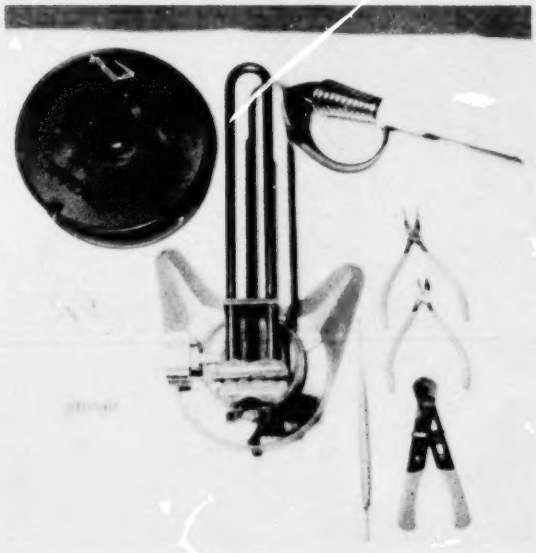
Student Equipment:

- Soldering Iron and Stand
- Wire Stripper
- Diagonal Cutters
- Needle Nose Pliers
- Soldering Aid
- Soldering Vise
- Solder
- Terminals
- Hookup Wire
- Resistors
- Capacitors (opt)
- Diodes (opt)

C. Set-up and Breakdown

An illustration of the correct set-up and breakdown procedures for the Electronic Assembly Work Sample is shown in the following series of figures. The soldering vise is placed in the front center of the work area. To the left is placed materials used in the assembly process. Tools used are placed to the right of the vise within easy reach of the student. The soldering iron is in the stand forward of the tools so as to prevent accidental burns, while still being easily accessible to the student.

Figure 1



Hookup Wire
Soldering Iron
Solder
Soldering Vise
Needle Nose
Soldering Aid
Resistors
Diagonals
Strippers

While giving instructions and pointing out work, the instructor stands to the side of the work unit so as not to interfere with the students view of the work sample. No alterations are required for wheelchair or left handed students.

Figure 2

Soldering Wire to Terminal Strip

When the sample is completed, the instructor removes the terminal strip from the vise and inspects all wires for proper positioning and inspects all joints for quality. Scoring is based on quality of work only. Time is not a factor in this sample. All tools and equipment are then restored in the box.

Timing Procedures:

Since time is not of the essence in the Electronics Course, it is not included in the scoring of this work sample, but should be kept for comparison purposes.

Quality Checks:

Quality is checked by comparing the work on each soldered joint to the work on the Task Observation and Scoring Record.

III. ADMINISTRATION

A. Student Orientation

Read or paraphrase the following information to the student:

> The work sample that you are about to do is called the Electronic Assembly Work Sample.
> The work you will be doing is like the work done by Electronic Assemblers in the electronics industry.
> On this Work Sample you will carefully solder four wire leads to terminals of a terminal strip.
> I'll show you how to do the work in a minute, but first, do you have any questions?

B. Instructions and Demonstrations

Sighted population

Statement	Action
Plug in iron. When it is heated you will use it to make soldered connections.	Indicated that the plug is to be put into the wall outlet.
Using the ruler, measure and cut a 2" length of hookup wire.	Indicate the length on the rule.
Using ruler, measure ½" from each end of the wire.	Indicate the ½" measure on the ruler.
Use the stripper to strip the ½" of insulation from each end of the wire.	Point to the wire stripper. Demonstrate it's use.
Tin the tip of the soldering iron by touching it to the end of a piece of solder.	Tell student to add a drop of solder to tipe of iron, then wipe it off.
Tin the bared ends of the wire previously stripped.	Add another drop of solder to the tip of the iron. Pass the iron tip along the stripped wire ends (called leads).
Bend the wire leads using the needlenose pliers to hold the lead, while inserting the lead into aide	Hand the needlenose pliers to student. Identify the soldering-aid. Demonstrate use of soldering aid.
Insert a terminal into the vise. Close the vise so that terminal strip is held securely.	Rotate vise crank each way to show closing and opening action. Point to terminal strip.

Statement	Action
Insert bent lead end into eye of terminal strip closest to left end of strip.	
Squeeze together the bent lead end so that it will hold itself in place.	
Place the hot tip of the soldering iron against the terminal strip and lead end. Hold iron in place until terminal and lead are hot enough to melt solder.	Indicate where tip is placed so that it does not touch the solder
Touch solder to terminal strip and wire lead together allowing solder to melt onto both.	
Remove tip and place iron securely in holding stand. Allow soldered joint to cool before moving leads.	Point to the stand.
Place the remaining end lead into the second end of the terminal strip and repeat all of the above processes for this lead.	Indicate the second eye of the terminal strip.
The bared wire in the joint should be completely covered with solder, but no solder drip should be present nor should the insulation be touching the joint.	Point out these errors if they are present.

Statement	Action
Pick up resistor and use the needle-nose pliers and soldering aid to bend the leads for insertion into terminal strip eye.	Indicate the resistor.
Indicate resistor leads into the third and fourth eyes of the terminal strip.	Point to eyes number three and four, on the terminal strip.
Solder each lead to the terminal strip as previously done with the wire leads.	
Replace the soldering iron carefully in its stand. Pull the plug from the wall socket and allow to cool.	Caution the student to pull only on the plug and not the wires.
Do you understand the instructions? Go ahead and begin.	

Reassembly should be done by the evaluator after soldering iron is cooled, and consists of returning all tools and materials to the box from which they were originally removed. Soldering aid is used to remove leads from terminal strips prior to use.

Post Sample Interview Topics

1. Like or dislike for the course.

2. Like or dislike for the course tasks.

3. Additional information needed about the course.

IV. SCORING

A. Explanations

1. Method of scoring:

   Productivity will be assessed by the completion of all tasks.
   Quality will be assessed by the total number of errors.

   For a complete list of errors see a scoring key.

2. Work performance factors to be observed:

   Student is able to follow verbal directions.

   Student has sufficient dexterity to manipulate the tools and equipment used in the sample.

B. Forms

1. Task Observation Record.

School _____

ELECTRONICS ASSEMBLER WORK SAMPLE

Task Observation Record

Critical Errors (3 pts each)

_____ 1. Leads not in place in terminal strip.

_____ 2. Lead not soldered.

_____ 3. Cold solder joint (from insufficient heat).

_____ 4. Insulation burned.

_____ 5. Solder drips (from applying too much solder).

Observational explanations for 1 through 5.

Task Quality Errors (1 pt. each)

_____ 6. Lead not wrapped through eye.

_____ 7. Too little solder used (does not cover lead).

Observational explanations for 6 and 7.

Put additional comments and observations below.

_____ Critical errors

_____ Task quality errors

_____ Min _____ Sec Total time

_____ Date taken

_____ Evaluator

_____ Student

V. TECHNICAL DATA

A supplement to this manual is being developed at the time of this printing. It will include:

1. Norms
2. Reliability, test-retest studies
3. Validity
   a. Content validity - established through the Course Analysis based on methods suggested by U. S. Dept. of Labor Job Analysis techniques.
   b. Predictive Validity
      To be established through follow-up studies of students previously tested.

VI. MAINTENANCE AND CONSTRUCTION

A. Maintenance

After each administration the evaluator should see that all materials are returned to the box from which they came.

B. Materials List

Equipment	Source	Price
Soldering Iron	Hardware Store	$17.75
Solder Iron Stand	Tewksbury Hardware	6.35
Wire Stripper	853 Main Street	2.95
Diagonal Cutters	Tewksbury, Mass.	7.50
Needle Nose Pliers		6.95
Solder		9.95
Soldering Aid	Contact East	1.87
Soldering Vise	7 Cypress Drive Burlington, Mass.	28.00
* Terminal Strips		4/ .99
* Hookup Wire	Radio Shack	60ft. 2.89
* Resistors (¼ watt)	(any major city)	100/ 2.98

Note: A small shop vise may be used in place of the more expensive soldering vise, provided the jaws are lined with an insulating material which does not readily conduct heat. Used strips of printed circuit board or formica will work adequately.

A complete kit of tools of lower quality is available at Radio Shack Stores for $14.95, including all necessary tools except the vise.

VII. REFERENCES

Korn, T. (ed.) A Work Sample Style Manual. Interface No. 10. Menomonic, WI.: Research and Training Center, University of Wisconsin - Stout, 1976.

United States Department of Labor, Dictionary of Occupational Titles, 3rd Edition. Washington, D. C.: United States Government Printing Office, 1965.

Handbook for Analyzing Jobs, Washington, D. C.: United States Government Printing Office, 1972.

Occupational Outlook Handbook, 1970-71 Edition. Washington, D. C.: United States Government Printing Office, 1970.

APPENDIX

Definition of Terms

GED - Is the general level of learning and reasoning acquired through schools, experience and self study. There are six GED difficulty levels, ranging from (6) the most difficult to (1) the simplest.

SVP - Is the special vocational preparation and training in terms of the total time required to prepare for an occupation. It ranges from SVP 1, short demonstrations only, to SVP 9, over ten years.

APT - Refers to aptitudes, which is the quickness and ease with which you can learn to do something. Aptitude definitions are included on a separate page in this manual.

WA - Work Activities:

1. Dealing with things and objects.
2. Involving business contacts.
3. Of a routine, definite, organized nature.
4. Involving direct personal contact to help or instruct others.
5. Resulting in recognition or appreciation from others.
6. Involving the communication of ideas and information.
7. Of a scientific and technical nature.
8. Involving creative thing.
9. Involving processes, methods or machines.
10. Involving working on or producing things.

WS - Work situations are the conditions under which the work involved in any occupation takes place. There are ten types described and they have been related to the 66 Worker Trait Groups in the Guide for Occupational Exploration. They are:

1. Performing duties which change frequently.
2. Performing duties of a routine nature.
3. Planning and directing an entire activity.
4. Dealing with people.
5. Influencing peoples opinions, attitudes, and judgements.
6. Working under pressure.
7. Making decisions using personal judgement.
8. Making decisions using standards that can be measured or checked.
9. Interpreting and expressing feelings, ideas, or facts.
10. Working within precise limits or standards.

PD - Physical Demands are the physical requirements of an occupation and are described in six areas as follows:

1. Lifting, carrying, pushing and/or pulling.
2. Climbing and/or balancing.
3. Stooping, kneeling, crouching, and/or crawling.
4. Reaching, handling, fingering, and/or feeling.
5. Talking and/or hearing.
6. Seeing.

WC - Working Conditions are the physical surroundings of a worker in a job. The DOL lists six different types as follows:

1. Inside or outside.
2. Extremes of cold plus temperature changes.
3. Extremes of heat plus temperature changes.
4. Wet and humid.
5. Noise and vibrations.
6. Hazards.

Aptitudes are rated on a scale of 1 - Highest to 5 - Lowest as follows:

1 - Top 10% of the population
2 - Top third not including the top 10%
3 - Middle third of the population
4 - Lowest third not including lowest 10%
5 - Lowest 10%

The following are the definitions of the aptitudes:

G - General Learning Ability - The ability to "catch on" or understand instructions and underlying principles; the ability to reason and make judgements. Closely related to doing well in school.

V - Verbal Aptitude - The ability to understand meaning of words, and to use them effectively. The ability to comprehend language, to understand relationships between words and to understand meaning of whole sentences and paragraphs.

N - Numerical Aptitude - Ability to perform arithmetic operations quickly and accurately.

S - Spatial Aptitude - Ability to think visually of geometric forms and to comprehend the two-dimensional representation of three-dimensional objects. The ability to recognize the relationships resulting from the movement of objects in space.

P - Form Perception - Ability to perceive pertinent detail in objects or in pictorial or graphic materials. Ability to make visual comparisons and discriminations and see slight differences in shapes and shadings of figures and widths and lengths of lines.

Q - Clerical Perception - Ability to perceive pertinent detail in verbal or tabular material. Ability to observe differences in copy, to proofread words and numbers, and to avoid perceptual errors in arithmetic computation. A measure of speed of perception which is required in many industrial jobs even when the job does not have verbal or numerical content.

K - Motor Coordination - Ability to coordinate eyes and hands or fingers rapidly and accurately in making precise movements with speed. Ability to make a movement response accurately and swiftly.

F - Finger Dexterity - Ability to move the fingers, and manipulate small objects with the fingers, rapidly and accurately.

M - Manual Dexterity - Ability to move the hands easily and skillfully. Ability to work with the hands in placing and turning motions.

MR - Mechanical Reasoning - The ability to understand mechanical principles (pulleys, gears, etc)

E - Eye-Hand-Foot Coordination - Moving the hands and feet together in response to visual signals or observations.

C - Color Discrimination - Seeing likenesses or differences in colors or shades. Identifying or matching certain colors. Selecting colors which go well together.